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<p>(21) International Application Number: PCT/US98/05336</p> <p>(22) International Filing Date: 18 March 1998 (18.03.98)</p> <p>(30) Priority Data: PI 9701349 19 March 1997 (19.03.97) BR</p> <p>(71) Applicant (for all designated States except US): MERITOR DO BRASIL S/A [BR/US]; 2130 West Maple Road, Troy, MI 48084 (US).</p> <p>(72) Inventor; and (75) Inventor/Applicant (for US only): MIKAMI, Celestino [BR/BR]; Avenida Major José Levy Sobrinho, 2700, CEP-13486-215 Limeira, SP (BR).</p> <p>(74) Agents: SLENZAK, Laura, M.; Meritor Automotive, Inc., 2135 West Maple Road, Troy, MI 48084 (US) et al.</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, GW, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</p>
<p>(54) Title: STRUCTURE AND METHOD FOR CONNECTING RIM AND DISK INTEGRATED WHEELS</p>		
<p>(57) Abstract</p> <p>A unique integrated wheel is disclosed wherein a groove (28) is formed with an angled surface to facilitate the flow of a weld material. A rim (24) extends into the groove (28) and has surfaces which act in conjunction with the surface of the groove to provide proper positioning and a secure connection. In addition, a method of forming the disk (22) is disclosed.</p> <div data-bbox="820 1144 1388 1942" data-label="Image"> <p>The diagram is a cross-sectional view of a wheel assembly. It shows a vertical disk (22) and a horizontal rim (24). A groove (28) is formed in the disk, and a rim (24) extends into this groove. A weld material (26) is shown filling the space between the rim and the disk. The rim has a curved surface (29) that fits into the groove. A label 11 points to the top of the disk. A label 22 points to the disk itself. A label 24 points to the rim. A label 26 points to the weld material. A label 28 points to the groove. A label 29 points to the curved surface of the rim. A label DET. A indicates a detail view of the rim and groove interface.</p> </div>		

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STRUCTURE AND METHOD FOR CONNECTING RIM AND DISK INTEGRATED WHEELS

BACKGROUND OF THE INVENTION

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This application relates to a unique connection between a rim and a disk in an integrated wheel.

Integrated wheels are known, in which a disk provides the entire forward face of the wheel. A rim is attached to a rear face of the disk, and
10 provides the other structure for properly mounting the tire.

Many methods have been utilized to connect the rim to the disk. In one common method, the rim and disks have been provided with telescopic structure which interfit to connect the two members.

Another type of integrated wheel has the rim welded to a rear face of
15 the disk. This method has some deficiencies in that proper positioning has been a challenge.

It is also known to provide a groove in the rear face of the disk and have the rim extend into the groove. The rim is then welded in the groove securing the two parts together. The groove has some desirable characteristics
20 compared to the other types of prior art in that it does assist in providing a secure connection and in properly positioning the rim relative to the disk. However, it would be desirable to improve upon the shape of the groove and the portion of the rim received in the groove.

25

SUMMARY OF THE INVENTION

In a disclosed embodiment of this invention, various configurations are provided for a groove in the rear face of a disk and the inner end of the rim. In addition, an outer sealing bead is also manufactured in a unique way.

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In particular, a number of unique groove embodiments are disclosed in combination with several different rim embodiments which provide a better

-2-

weld joint and better positioning of the two parts. In one embodiment, the rim and the groove have a roughly equivalent cross-section such that the rim is closely secured within the groove and that the weld joint can provide a good interface between the two. In other embodiments, the groove and the rim have distinct configurations. In particular, it is preferred that the groove have angled surfaces to facilitate the flow of the weld material. In a most preferred embodiment of this invention, the groove has one angled surface moving downwardly to a side wall. The rim for this embodiment has an angled inner face leading to an end face. The angled face of the rim, along with the angled face of the groove, facilitates material flow onto both sides of the rim. The weld joint may be achieved by known welding techniques, such as friction welding.

In a method, an outer surface of the disk is initially formed to be generally planar. The outer part is then bent axially outwardly. Portions of the axially outermost and radially outermost portions are then machined away. In one embodiment, intended for a painted surface, the surface is removed in a curved configuration. In a second embodiment, intended for receiving a cladding skin, a ledge is formed in the outer surface to receive a cladding portion.

These and other features of the present invention can be best understood from the following specification and drawings, the following of which is a brief description.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side view of an integrated wheel showing features of the present invention.

Figure 2 shows a second embodiment of the inventive full face wheel.

Figure 3 shows a step in machining the disk of this invention.

Figure 4 shows a first embodiment groove.

Figure 5 shows a second embodiment groove.

Figure 6 shows a third embodiment groove.

Figure 7 shows a fourth embodiment groove.

Figure 8 shows a fifth embodiment groove.

Figure 9 shows a first embodiment rim end portion.

5 Figure 10 shows a second embodiment rim end portion.

Figure 11 shows a third embodiment rim end portion.

Figure 12 shows a fourth embodiment rim end portion.

Figure 13 shows a fifth embodiment rim end portion.

Figure 14 shows a sixth embodiment rim end portion.

10 Figure 15 shows a seventh embodiment rim end portion.

Figure 16 is an enlarged view of a portion of Figure 1 showing the connection of the rim to the disk.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

15

Figure 1 shows an integrated wheel 20 having a disk 22 secured to a rim 24. As shown, a weld joint 26 is placed near a groove 28 to secure an end 30 of the rim 24. The preferred shapes of the groove and rim will be detailed below. As shown at 31, the radially and axially outermost portion of the disk is curved. A feature of this invention is the unique way that this surface is formed, as will be explained below. This shape is particularly well-suited for a wheel wherein the disk is to be painted.

20

Figure 2 shows a disk embodiment 40 wherein a notch 42 is formed in the radially and axially outermost surfaces of the disk. This embodiment is particularly well-suited to receive a cladding skin.

25

Figure 3 shows a method of forming the inventive disk. As shown, a cutting tool 50 cuts the groove 28 into the disk. As will be disclosed below, there are many possible shapes for the groove, and the cutting tool 50 can cut any one of the shapes. It is well within the skill of a worker in this art to define a cutting tool for cutting a particular shape.

30

As shown in Figure 3, the disk is initially formed with a flange 52 extending generally planar with the remainder of the disk. That portion is deformed by a tool 53, shown schematically to extend axially forwardly as shown at 54. Another tool 55 machines surface 31, such as shown in Figure 1
5 (or alternatively, the shape 42 as shown in Figure 2).

As show in Figure 4, embodiment 60 groove has a surface 62 defined at an angle a , which is designed to provide proper positioning and strong attachment to the rim and the groove. A surface 64 is defined at an angle b , designed to receive the melted weld material by the deposed weld joint, or the
10 melting of the disk and rim during the welding process. The groove 60 deepest depth is set forth by a dimension x .

Figure 5 shows a groove 66 with three surfaces 68, 70 and 72. Surface 68 is set forth at an angle a , which is intended to facilitate the attachment of the rim into the disk groove. Surface 70 extends for a dimension y , and
15 surface 3 is angled at an angle b , which again functions to receive the weld material.

Figure 6 shows an embodiment 72 having a first flat surface 74 extending for a distance x , and defined at an angle a relative to a vertical plane, with the angle a facilitating the attachment of the rim into the disk
20 groove. A second surface 76 is curved and formed at a radius R from the end point of surface 74 extended into the plane extending perpendicularly into the groove 72. A third surface 78 is angled at an angle b , and again functions to receive the weld material.

Figure 7 shows a groove 80 with the first surface 82 defined at an angle a which facilitates the attachment of the rim into the disk, and also receives melted weld material which is deposited, or from the base rim or disk
25 during the welding process. The surface 82 is limited to a depth x . The second surface 84 is set at an angle b , again to facilitate the attachment of the rim into the disk groove and receive the melted weld material. This surface
30 84 also extends to a depth x .

Groove 86 is shown in Figure 8, and has a surface 88 defined at an angle a relative to a vertical plane, a flat surface 90 extending over a width y , and a second angled surface 92 defined at an angle b . The surfaces 88 and 92 provide functions similar to the above-discussed grooves. The grooves depth is again set by the dimension x .

Figure 9 shows a first embodiment rim end portion 100 having an angled end surface 102 defined at an angle b which facilitates the attachment into the disk groove, and also provides a space for weld material. This rim is particularly well-suited to the groove shown in Figure 4.

Figure 10 shows a rim 104 having an angled surface 106 defined at the angle b , again for weld material. A surface 108 is formed at the end, and is generally flat and extends over a distance x . The function of this surface is to rest into the disk groove. This rim also has a curved edge shown by the radius R . This rim is particularly well-suited for the groove of Figure 5.

Figure 11 shows a rim 110 having a surface 112 defined at an angle b which is for weld material. A second flat surface 114 extends over a distance x and assists in the resting of the rim in the groove. A surface 116 extends upwardly for a distance y at an angle a , and facilitates the attachment of the rim into the disk groove. This rim is particularly well-suited for the groove shown in Figure 5.

Figure 12 shows a rim embodiment 120 having curved edges 122 formed about a radius R . Flat surface 124 assists the rim in resting within its groove. This rim is particularly well-suited for the groove shown in Figure 8.

Figure 13 shows a rim embodiment 126 having a curved surface 128 which rests in the groove. The curved surface 128 is formed at a radius R . The side surfaces 130 provide contact space for weld material. This rim is particularly well-suited to be used with the groove shown in Figure 6.

Figure 14 shows a rim embodiment 132. Rim embodiment 132 has a first side surface 134 formed at an angle a , and provides an improved attachment of the rim to the disk groove, and a space for weld material. A second surface 136 is formed at an angle b , and functions for welding

material. The rim 132 is particularly well-suited to be used with the grooves shown in Figures 7 or 8.

5 Figure 15 shows a groove embodiment 140 having a first surface 142 formed at an angle a which improves the attachment of the rim into the disks and provides space for the melted weld material. A flat surface 144 assists the rim in resting within the groove. Another angled surface 146 is formed at an angle b , which functions to provide a space for weld material. The rim 140 is particularly well-suited to be used with the groove shown in Figure 8.

10 Figure 16 shows the preferred assembly such as shown in Figure 1. This combination combines the Figure 5 groove 66 with the Figure 11 rim 110. The surface 68 in combination with the surface 116 includes appropriate angles to ensure correct positioning and assembly, and to ensure the radial concentricity of the final wheel.

15 The flat surface 70 in combination with the flat surface 114 ensures proper axial positioning. The angled surface 72, in combination with the angled surface 112 ensures that the weld material does secure the two members together. The weld material 150 is shown as a large bead which will secure the rim to the disk.

20 The present invention improves upon the prior art systems which have provided a rim received within a groove, by improving upon the structure of the groove and the rim. With the present invention, correct positioning of the rim relative to the disk is much more likely to be achieved. Further, a very reliable connection is assured with this invention.

25 Preferred embodiments of this invention have been disclosed, however, a worker of ordinary skill in the art would recognize that certain modifications would come within the scope of this invention. For that reason, the following claims should be studied to determine the true scope and content of this invention.

CLAIMS

1. An integrated wheel comprising:
a disk member having a forward face and a rear face, and said rear
5 face being formed with a groove extending into an otherwise generally planar
surface, said groove being formed with at least one angled surface at one
radial extent of said groove; and
a rim member having an axial end welded within said groove.
- 10 2. A wheel as recited in Claim 1, wherein said groove has angled
surfaces at each radial extent of said groove.
3. A wheel as recited in Claim 2, wherein said axial end of said
15 rim also has an angled surface.
4. A wheel as recited in Claim 3, wherein said axial end of said
rim has a first portion which is generally planar, and said angled portion
extending from said planar edge.
- 20 5. A wheel as recited in Claim 1, wherein said angled surface
merges into a generally rectangular groove.
6. A wheel as recited in Claim 1, wherein said angled surface
25 merges into a generally semicircular portion of said groove.
7. A wheel as recited in Claim 1, wherein said groove has a
generally flat surface which is generally perpendicular to a rotational axis of
said wheel, and said angled surface connecting into said flat surface.
- 30 8. A wheel as recited in Claim 1, wherein a radially outermost
portion of said disk is formed with a curved surface.

9. A wheel as recited in Claim 1, wherein a radially and axially outermost surface of said disk is formed with a notch to receive a cladding skin.

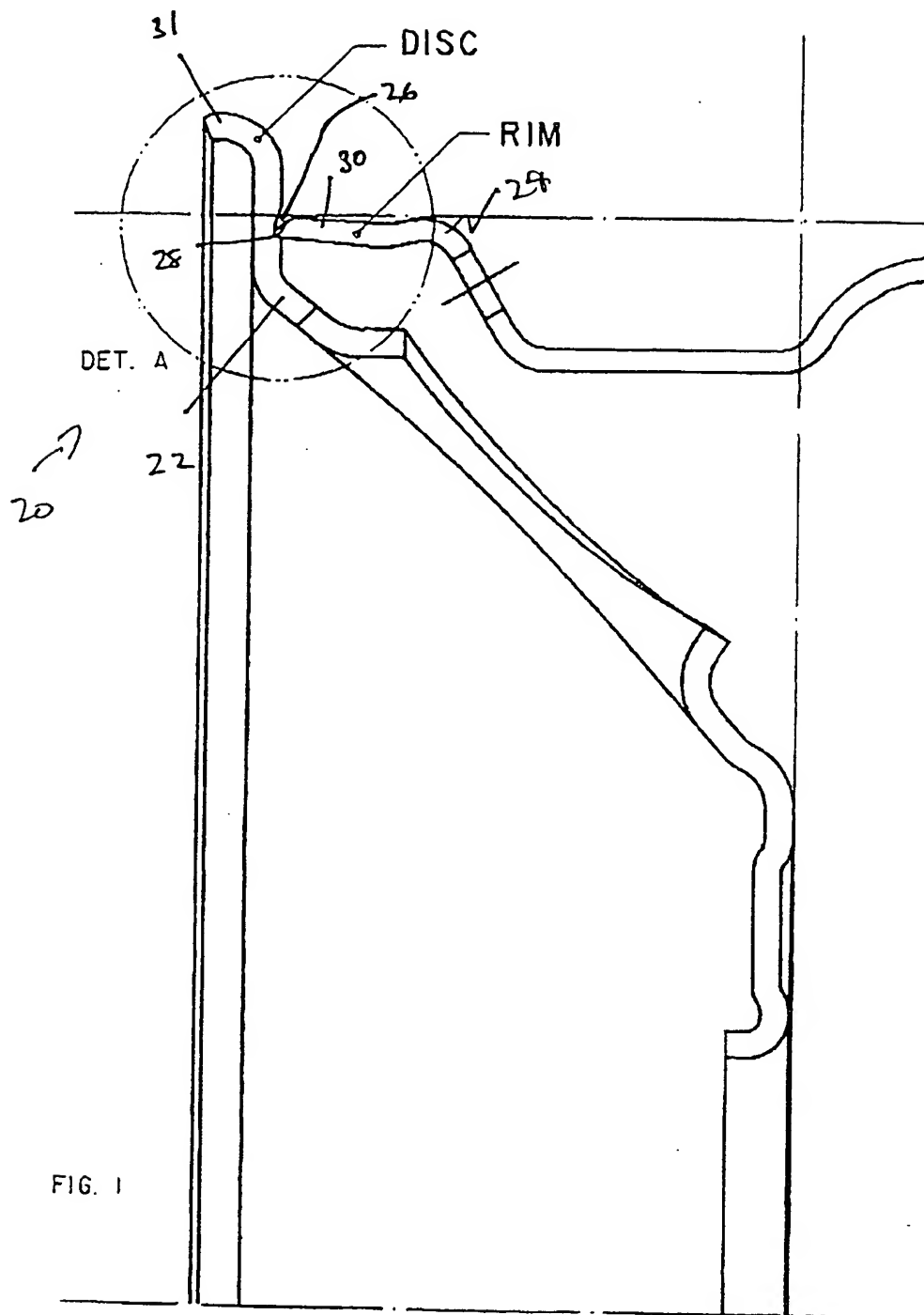
5 10. A method of forming a disk for an integrated wheel comprising the steps of:

- (1) forming said disk to have a radially outwardly extending flange;
- (2) deforming said flange axially forwardly; and
- 10 (3) removing a portion of material from an axially and radially outermost end of said flange to form a finished surface.

11. A method as recited in Claim 10, wherein a rear face of said disk is formed with a circumferential groove.

15 12. An integrated wheel comprising:
a disk member having a forward face and a rear face, said rear face being formed with a groove extending into an otherwise generally planar surface, said groove being formed with a first angled surface extending downwardly to a second surface extending to said rear face; and
20 a rim member having an axial end extending into said groove and welded within said groove, a weld joint formed on each radial side of said rim, said rim end portion having an angled innermost portion received within said groove.

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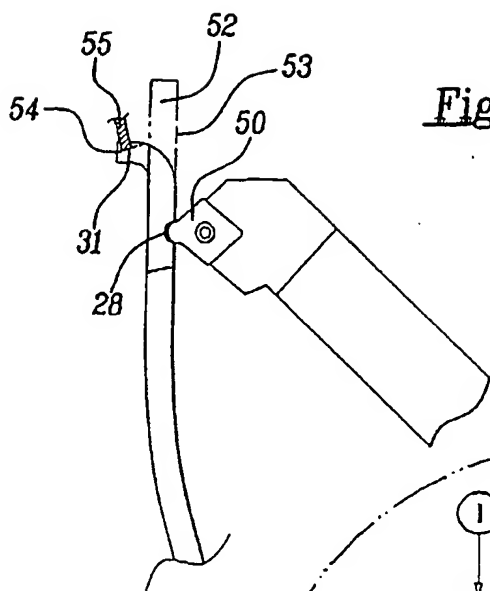


Fig-3

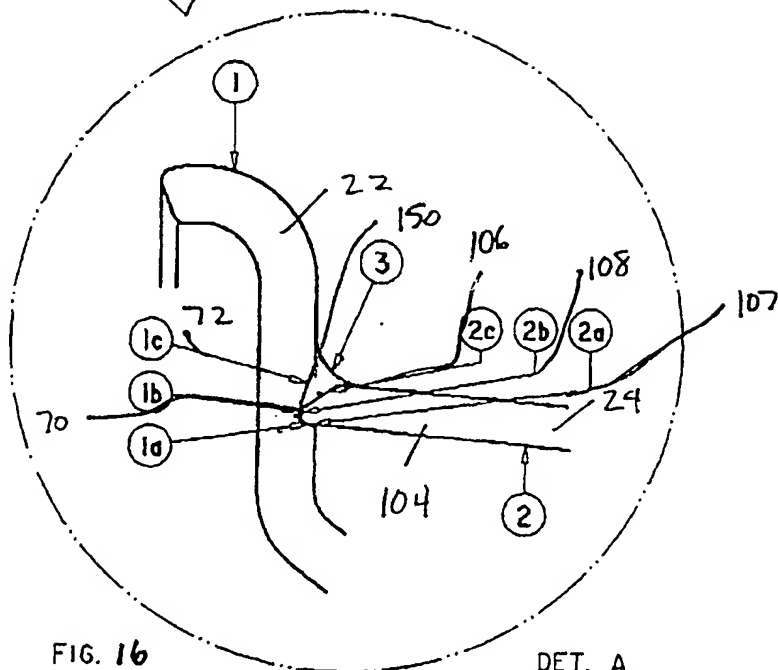


FIG. 16

DET. A
(FIG. 1)

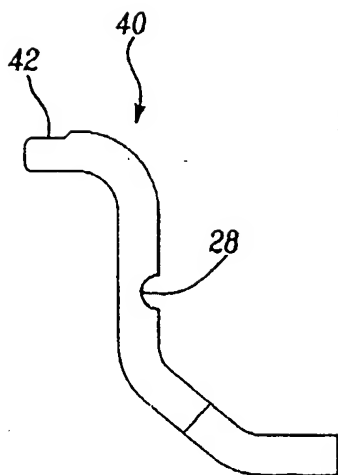


Fig-2

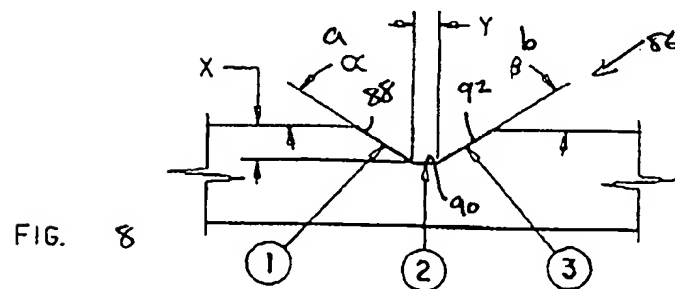
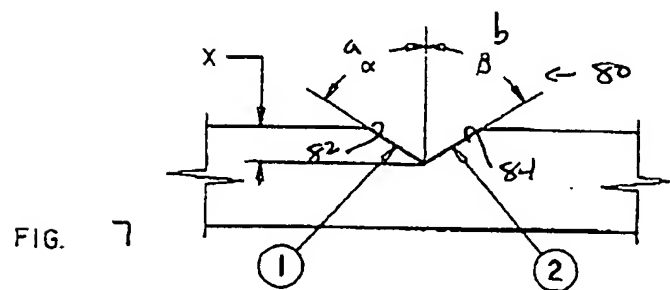
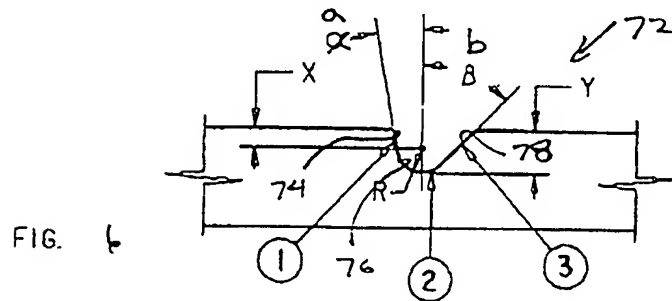
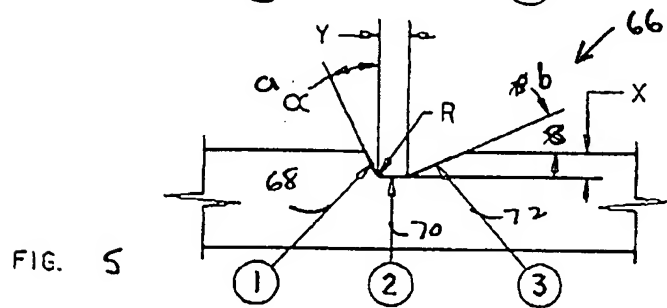
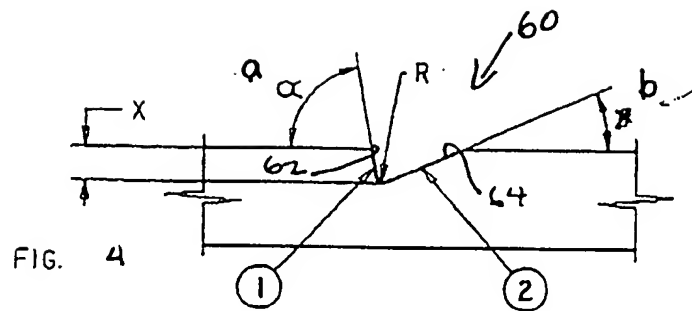


FIG. 9

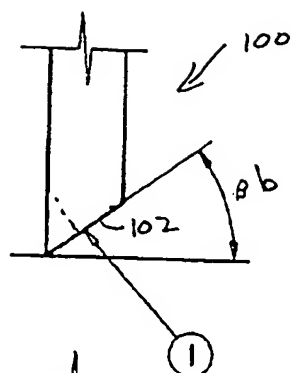


FIG. 10

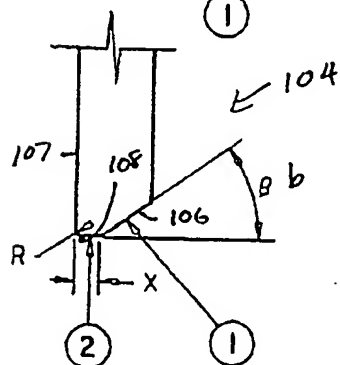


FIG. 11

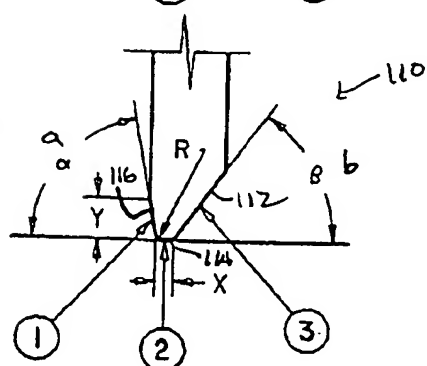


FIG. 12

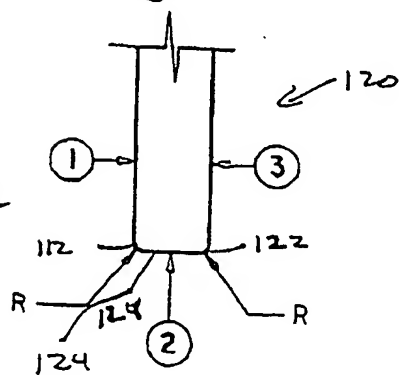


FIG. 13

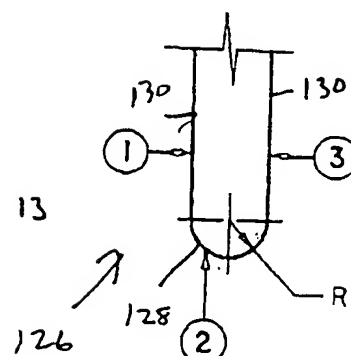


FIG. 14

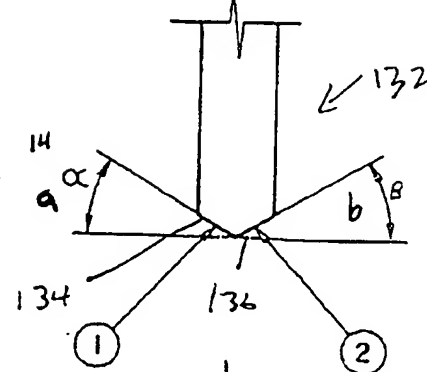
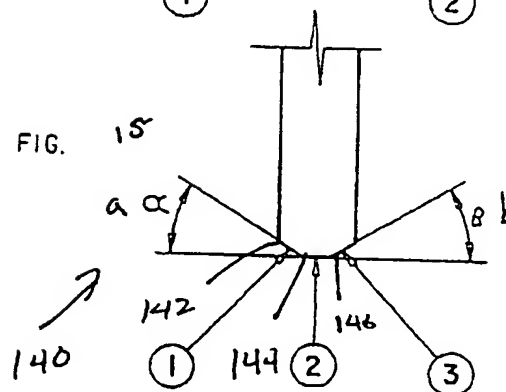


FIG. 15



INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B60B3/04 B23K33/00

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Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	PATENT ABSTRACTS OF JAPAN vol. 017, no. 123 (M-1380), 15 March 1993 & JP 04 305388 A (TOPY IND LTD), 28 October 1992, see abstract	1-5, 7, 9, 11, 12
X	WO 85 02586 A (SPÄTH) 20 June 1985 see page 8, line 17 - page 11, line 8; figures 2-4	1-9, 11, 12
A	US 5 345 676 A (ASHLEY) 13 September 1994 see column 1, line 12 - line 55; figures	10
A,P	WO 97 47482 A (ACCURIDE CORPORATION) 18 December 1997 see page 14 - page 16; figures	1
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A	WO 96 18753 A (HAYES WHEELS INTERNATIONAL) 20 June 1996	
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Information on patent family members

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